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PATENT ABSTRACTS OF JAPAN

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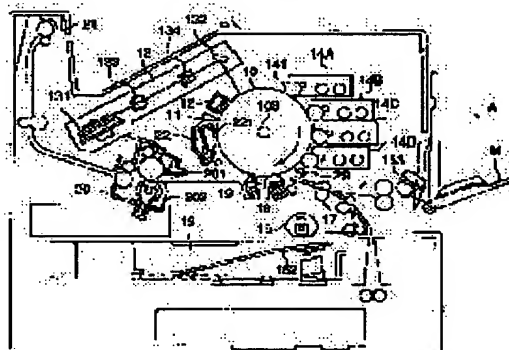
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(54) LINE WIDTH CONTROL METHOD

(57)Abstract:

PURPOSE: To control the line width of a toner line image to be specified line width by detecting an inflection point in the inclination of reflection density from a toner line image and a patch image by using an index signal and adjusting the condition of an electrophotographic process from data at the inflection point.

CONSTITUTION: An MPU performs line width measuring processing continuously to the deciding operation of the revolving speed of a developing sleeve 141. Namely, the MPU measures printing density in order to obtain excellent printing quality and resets it to an initial value, continuously sets a line pitch at the initial value to successively change a PWM value, obtains the inflection point, and recognizes the inflection point to be that the line width of the toner image and the pitch are equal. The MPU calculates the inclination to pulse width used for forming the patch image to obtain image density. Then, the MPU calculates the optimum pulse width from the obtained inflection point. The calculating accuracy of the inflection point depends only on the index signal for controlling the operation timing of a write means 13.



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CLAIMS

[Claim(s)]

[Claim 1] A line breadth control method characterized by providing the following A pulse width control process of adjusting a pulse width signal which controls luminescence of the light source A patch latent-image formation process which forms a patch latent image which consists of two or more line latent images by irradiating light from said light source A **** process which develops said patch latent image in a patch image which consists of a toner line image A process which forms two or more patch images with which a **** process is repeated from said pulse width control process, and gradation differs, a process which measures optical density of said patch image, a point-of-inflection detection process of detecting point of inflection in ** of reflection density using an index signal from said toner line image and patch image, and a process condition adjustment process of adjusting conditions of an electrophotography process from data in said point of inflection

[Claim 2] Said patch image is the line breadth control method according to claim 1 characterized by piling up two or more colors.

[Claim 3] Said patch image is the line breadth control method according to claim 1 or 2 characterized by changing a gap, setting line breadth of a toner line image as constant.

[Claim 4] Said patch image is the line breadth control method according to claim 1 or 2 characterized by changing line breadth of a toner line image.

[Claim 5] Magnitude of said patch image is the line breadth control method according to claim 1 or 2 characterized by having made it larger than measuring range of a sensor.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the line breadth control method of adjusting the line breadth of the line image reproduced in an electrophotography process to predetermined width of face.

[0002]

[Description of the Prior Art] In the image formation equipment which adopts an electrophotography process, the reproduced line image changes the concentration and line breadth of an image with the temperature of image environment, humidity, image support, the use counts of a developer, etc. In the image formation equipment which forms a toner image by reversal development on image support, the phenomenon of changing the width of face of a linear toner image is explained with reference to drawing 12.

[0003] Drawing 12 is a mimetic diagram explaining the phenomenon of changing the width of face of a linear toner image. Drawing 12 (a) VZ which - (e) takes potential along an axis of ordinate, and length is shown on a horizontal axis, shows the concentration and line breadth of a toner image typically by this, and is shown according to a two-dot chain line shows rest potential. Drawing 12 (a) is the mimetic diagram showing the latent image which carried out image exposure and formed image support after being charged. Drawing 12 (b) shows the portion equivalent to toner coating weight, when the latent image shown in drawing 12 (a) is developed, and the dotted line shows the surface potential of a toner. Drawing 12 (c) is the mimetic diagram showing the latent-image potential at the time of going up from the initial state which rest potential Vz showed to drawing 12 (a) by repeat activity. The alternate long and short dash line in drawing 12 (d) shows the portion equivalent to the toner coating weight when developing the latent image shown in drawing 12 (c). Although it is hardly different from the line breadth of the toner image shown in this field sign 12 (b), it is shown that image concentration falls. Although what controlled and developed development conditions shows by the dotted line and shows that image concentration can be made the same in order to amend lowering of this image concentration, it is shown that line breadth increases. Although there is no change in the maximum image concentration when drawing 12 (e) shows the condition with the loose gamma characteristics of the sensitization layer of image support of having carried out direction change and develops it under these conditions, it is shown that line breadth becomes narrow.

[0004] In order to suppress change of the image concentration and line breadth which were mentioned above, an environmental temperature and humidity are measured, and when temperature is high, detecting and feeding back the line breadth and image concentration of a toner image etc. is performed by measuring amendment of setting up electrification potential more highly, and the reflection density of a toner patch. For this line breadth measurement means, a direct measurement method and an indirect-measurement method can be considered.

[0005] Drawing 10 is the block diagram showing a line breadth measurement means to measure the line breadth of a toner image directly.

[0006] The line breadth measurement means of this direct measurement method can consider detecting the line breadth of a toner image by having the image formation lens L2 which expands and carries out image formation of the light which reflects the light from the light source P from the image formation lens L1 which carries out image formation to the image support Z, and the toner image TG which supported to the image support Z to a photo detector LS, and counting the output signal from a photo detector LS.

[0007] Drawing 11 is the block diagram showing a line breadth measurement means to measure the line breadth of a toner image indirectly.

[0008] The line-breadth measurement means of this indirect-measurement method is equipped with the image-formation lens L3 which reduces and carries out image formation of the light which reflects the light from the light source P from the image-formation lens L1 which carries out image formation to the image support Z, and the toner image TG which supported to the image support Z to a photo detector PD, regards the front face of image support as change of wrap coverage, and detects it as change of the amount of reflected lights by the photo detector PD which has a single light sensing portion. Since the photo detector PD adopted here has a single light sensing portion and it is sufficient for it, it becomes cheaper than a line breadth measurement means to measure direct radiation width of face as shown in drawing 10.

[0009]

[Problem(s) to be Solved by the Invention] However, in spite of having fed back by amendment of the above-mentioned electrification potential, or measurement of the reflection density of a toner patch, since change of line breadth was as small as several micrometers to about 10 micrometers, there was nothing that can be measured

directly with cheap equipment. Since a line breadth measurement means as shown in drawing 10 will specifically need the line sensor formed in the pitch of about several micro per pixel in order to detect fluctuation of line breadth with a sufficient precision, and the scale factor of the optical system which consists of a photo detector L2 will need an about 10-time scale factor, it becomes cost high. If the focal distance of the above-mentioned optical system is set to 5mm, since the whole sensor serves as magnitude of 50mm or more, it becomes the magnitude which is hard to include in the image formation equipment in the inclination to miniaturize. On the other hand, since the line breadth measurement means explained with reference to drawing 11 will grasp the toner image as a gestalt for which two or more linear toner images gathered, it cannot distinguish and measure change of line breadth, and change of image concentration. Therefore, even if it adjusted development conditions etc. and has maintained image concentration to predetermined, since the output level from a photo detector PD was related to the line breadth of a toner image, an output will also change with an environmental variation, aging, dirt, etc., and it was not able to amend the error. Moreover, since an absolute precision of a sensor was required of any method, it did not have what can be used being able to incorporate in image formation equipment. Moreover, the circuit for driving a line sensor and the circuit which reads the output signal from a line sensor also become intricately and expensive.

[0010] The object of this invention is to offer the line breadth control method which controls the toner line image which detects the line breadth of a toner line image by several micrometers to about 10 micrometers, and is reproduced to predetermined line breadth in view of the above-mentioned trouble.

[0011]

[Means for Solving the Problem] There are the following as a means to attain the above-mentioned object.

[0012] (1) A pulse width control process of adjusting a pulse width signal which controls luminescence of the light source, A patch latent-image formation process which forms a patch latent image which consists of two or more line latent images by irradiating light from said light source, A **** process which develops said patch latent image in a patch image which consists of a toner line image, A process which forms two or more patch images with which a **** process is repeated from said pulse width control process, and gradation differs, and a process which measures optical density of said patch image, A line breadth control method which consists of a point-of-inflection detection process of detecting point of inflection in ** of reflection density using an index signal from said toner line image and patch image, and a process condition adjustment process of adjusting conditions of an electrophotography process from data in said point of inflection.

[0013] (2) Said patch image is the line breadth control method of (1) characterized by piling up two or more colors.

[0014] (3) Said patch image is either line breadth control method of (1) and (2) characterized by changing a gap, setting line breadth of a toner line image as constant.

[0015] (4) Said patch image is either line breadth control method of (1) and (2) characterized by changing line breadth of a toner line image.

[0016] (5) Magnitude of said patch image is either line breadth control method of (1) and (2) characterized by making it larger than measuring range of a sensor, and having carried out.

[0017]

[Example] Drawing 1 is the outline block diagram showing the image formation equipment of this example, and drawing 5 is a graph which shows the potential property of the image support adopted as the image formation equipment of this example.

[0018] For every revolution of the image support 10, it is based on the electrification machine 12 and the image formation equipment of this example is charged, as shown in drawing 1. The electrostatic latent image whose color was separated on the image support 10 by image exposure by write-in equipment 13 is formed. To the periphery of the image support 10 in order are full color and to reproduce the electrostatic latent image concerned Yellow, Make it operate selectively from the development counters 14A-14D which contained the two component developer which consists of a Magenta, cyanogen, and a black toner and a black carrier, respectively, and it develops in a toner image. By repeating a series of processes which form the toner image concerned in the image support 10 two or more times for every color, after bundling up with the imprint roller 18 to the imprint material sent from a sheet paper cassette 15 after piling up each color toner image on the image support 1 and imprinting to it, it is established with an anchorage device 20.

[0019] The main part housing of image formation equipment is formed from the upright side panel 1 (not shown) and the upright side panel 2 (not shown). The development unit 120 which stores two or more development counters 14A-14D with write-in equipment 13 and the image support 10 among side panels 1 and 2, Furthermore, an anchorage device 20 and a DC power supply unit (not shown) are incorporated. On the other hand, the control board (not shown) for operating-sequence control of a drive system, the formatter (not shown) which decodes a printer command, and a machine is stored in the outside of a side panel 2. Moreover, a toner makeup means 140 to connect with each development counters 14A-14D in the development unit 120 is held in the upper part of the development unit 120.

[0020] The image support 10, the electrification machine 12, and cleaning equipment 22 are incorporated and united with the drum cartridge 130 (not shown), and, on the other hand, each development counters 14A-14D and a toner makeup means (not shown) are incorporated and united with the stand 100 (not shown). A stand 100 is positioned in the location which can perform image formation actuation, or is equipped with the configuration for moving almost horizontally and setting it as the drawer location from the stowed position to the main part of equipment, as shown in drawing 1.

[0021] The guide idler 53 (not shown) is provided so that each inner surface of a side panel 1 and a side panel 2 which forms the main part of equipment may be faced at a upper rail 51 (graphic display ****) and the lower rail 52 (not shown), and on the other hand, it has the plate-like part material 41 which equips the side of the right and left with the rotation roller 42, and the rotation roller 42 is engaged with the guide member 50, and a stand 100 engages plate-like part material 41 the very thing with a guide idler 53, respectively, and supports It is an outline configuration for attaining the function which this mentioned above.

[0022] Below, it is attached to the configuration and function of each part material, and explains.

[0023] The image support 10 on the conductive base material of phi 120 fabricated from the aluminum For example, coating of the under-coating layer of 0.3 micrometers of thickness is carried out with alcoholic fusibility polyimide. Apply the CGL agent which distributed the polyvinyl butyral for Y mold CHITARU phthalocyanine on the under-coating layer concerned, and coating of the CGL of 0.3 micrometers of thickness is carried out. It is the electrophotography photo conductor which carried out coating of the CTL of 25 micrometers of thickness which consists of a polycarbonate and a still triphenylamine system compound, and carried out the laminating of an interlayer and the sensitization layer on the CGL concerned, and has grounded. The encoder (not shown) is formed in the driving shaft 103 of the image support 10, and thereby, MPU210 detects the phase of the image support 10, and has been made to perform the electrophotography process.

[0024] Here, the potential property of the image support 10 is explained with reference to drawing 5.

[0025] The surface potential ($-V$) of the image support 10 is shown on the axis of ordinate by the graph shown in drawing 5, and the power (mW) of semiconductor laser is shown on the horizontal axis. O The potential property in 20-degree-C50%RH (this may be hereafter called ordinary temperature normal relative humidity NN) is shown, ** shows the potential property in 30-degree-C80%RH (this may be hereafter called high-humidity/temperature HH), and ** shows the potential property in 10-degree-C20%RH (it may be called low-humidity/temperature LL). This graph shows changing the surface potential in the exposure field of the image support 10 with environmental temperature humidity. Here, an exposure field means fields other than initial electrification potential.

[0026] The driving shaft 103 and the revolution of both the flanges 101,102 (not shown) that support image support 10 peripheral surface are enabled, and they form the spring member 105 between the holddown member 104 (not shown) fixed to the driving shaft 103, and one flange 101, and have connected each other with it. When it does in this way, an effect equivalent to having made low rigidity of a drive system which consists of image support 10 and a driving shaft 103 is acquired, a resonant frequency is lowered, and it can avoid resonating with fluctuation of the oscillation from a driver G. And fluctuation of the rotational speed inputted into the driving shaft 103 can be made to be able to absorb by the low rigidity member, and the image support 10 can be rotated, without producing fluctuation of 100 mm/sec linear velocity.

[0027] in order to abolish the hysteresis of the photo conductor to a front print in advance of negative electrification in which the image support 10 was stabilized according [PCL11] to the electrification machine 12 since revolution actuation is carried out by realizing the driving force transfer method with this configuration — light emitting diode etc. — using — exposure — carrying out — the sensitization layer peripheral surface of the image support 10 — discharging electricity. The electrification machine 12 gives uniform electrification of VH-850V by carrying out corona discharge to VG to the peripheral surface of the image support 10 from the corona discharge wire which consists of a grid by which potential maintenance was carried out, and a platinum wire (a clad or alloy).

[0028] Through the polygon mirror 131 and ftheta lens 133 grade which make the laser diode which is not illustrated based on a picture signal after being uniform charged to the sensitization layer of the image support 10 the luminescence light source, and rotate, write-in equipment 13 bends an optical path by the reflective mirror 132, scans, and forms a latent image by the revolution (vertical scanning) of the image support 10. That is, if the image data from a formatter is sent to a laser diode (LD) modulation circuit and a laser diode emits light with the modulated picture signal, the synchronization of each scanning line will be achieved by the beam index 136 (not shown) through a mirror 137 (not shown), and it will be projected on the beam light by the polygon mirror 131. The polygon mirror 131 reflects and scans beam light with the polyhedron, after, as for the scan light, a beam shape is amended by the ftheta lens 133 and the cylindrical lens 134, it exposes a photo conductor through the reflective mirror 132, performs horizontal scanning, and forms an electrostatic image. the polygon mirror 131 — a 6th page mirror — pneumatic bearing adoption of rotational frequency 23600rpm — it carries out. The focal distance of the ftheta lens 133 and cylindrical-lens 134 grade is $f=140\text{mm}$. Dot clocks are 20MHZ(s). A beam diameter is about 140x100 micrometers. It is latent-image potential VL-50V of this beam diameter.

[0029] In order to obtain a high quality picture, it is necessary to also make particle size of a toner small. In this example, each color is using the toner with a size of 8 micrometers. However, for a user, black alphabetic character quality is the most important and the diameter toner of a granule (7 micrometers - 11 micrometers) is suitable for a black toner. thereby, the print density of image formation equipment also boils *****, it is 12 dot(s)/mm and the dot pitch may be 1/12mm.

[0030] The toner supplied from the toner box (not shown) falls at the right edge of a development counter, and churning mixing is carried out by the churning screw of the couple which rotates in the opposite direction with a carrier, and it is set as the predetermined amount (Q/M) of electrifications by it.

[0031] On the other hand, toner concentration is detected by L *****, controls the amount of supply of a toner based on this output frequency, and setting-out control is carried out at 5 thru/or about 7% of toner concentration value.

[0032] The agitated two component developer is conveyed by the development sleeve 141 through a feed roller 143,

it is made a thin layer by thickness specification—part material (not shown), is conveyed two times 20 to 30 mg/cm in the development region of the image support 10, and performs reversal development of an electrostatic latent image according to the development conditions described below.

[0033] as 0.5mm with the larger gap of the development sleeve 141 and the image support 10 in a development region than thickness (developer) — during this period — AC bar of 2kV and 8KHZ — a chair and the DC bias of -750V are overlapped and are impressed. The development sleeve 141 is rotated normally to the image support 10, since electrification of VDC, VH, and a toner is like-pole nature, the toner which was able to give the cause to secede from a carrier does not adhere to the portion of VH with potential higher than VDC, but adheres to VL portion with potential lower than VDC, and development (reversal development) is performed by VAC.

[0034] In addition, it is also possible to enable it to check a residue by looking easily by fabricating a toner bottle with a translucent material at the same time it carries out small simplification of the feeder of a toner by using the toner bottle with which the aforementioned toner box is loaded as a toner hopper as it is, although not illustrated.

[0035] Imprint material (not shown) is stored on single-sided criteria in the sheet paper cassette 15, therefore it sells, and a pawl 151 is inclined and located in the datum-level side of imprint material, being prepared only in the datum-level side of imprint material, and a roller 16 also being further used as a cantilever structure for a half moon.

[0036] The feed section has the motor (not shown) of dedication, deals with the imprint material which the roller 16 rotated and pushed up in the **** direction for a half moon, and was loaded on the board 152, and takes out only one sheet of the maximum upper layer according to an operation of a pawl 151.

[0037] After the imprint material taken out from the sheet paper cassette 15 suspends a motor by detection of the feed sensor which is not illustrated just after close makes a U-turn to a conveyance system way and a head passes the feed roller 17, a motor begins a revolution again in the phase in which the timing of an imprint was ready, and it maintains a predetermined angle to the sensitization stratification plane of the image support 10, and is fed to the imprint region.

[0038] On the other hand, feeding by manual bypass is performed by rotating and setting to the location shown as a continuous line from the location which shows the manual paper feed base M located in the front face of the main part of equipment with the alternate long and short dash line of drawing 1.

[0039] The paper by which manual bypass was carried out is conveyed by revolution of a pickup roller 153, and is fed to an imprint region through the same process as feeding from the sheet paper cassette 15 mentioned above.

[0040] The papers made into the object of a manual paper feed are the cardboard of 36lbs besides the general imprint material P of 16lbs(es) usually used thru/or 24lbs(es), the transparency for OHP, etc. Moreover, feeding of an envelope is also possible by removing the manual paper feed base M and equipping with the feeder of dedication as an option.

[0041] Although the location to the peripheral surface of the image support 10 is adjustable and is always put on a pressure-welding condition at the time of the print of a monochrome image, the imprint roller 18 is maintained at the location which evacuated during formation of a color picture and was estranged, and a pressure welding is carried out only at the time of an imprint. On the other hand, the separation brush 19 also carries out actuation of a pressure welding and alienation to the peripheral surface of the image support 10 almost synchronizing with location fluctuation of the imprint roller 18. By +3 thru/or 4KVDC(s), the imprint roller 18 of the format which cleans a roller side with a blade is used, and it is used for this imprint roller 18 for the bias voltage which superimposed DC and AC to the separation brush 19 by applied voltage, impressing.

[0042] An anchorage device 20 is the so-called anchorage device of the heat mechanical control by roller which consists of the roller of a couple, carries out heating conveyance of the imprint material P by the nip section which carried out the pressure welding to the upper roller 201 and this upper roller 201 which contain Heater H and carry out an actuation revolution clockwise, and was formed between the lower rollers 202 which carry out a follower revolution, and performs joining of a toner image. Siwa of the space which is easy to produce in case an envelope etc. is conveyed is prevented by each up-and-down roller's of both having the heat-resistant tube covered, and forming the nip section in the shape of a straight line by the pressure welding. Clearance cleaning of the dirt which the peripheral surface temperature of an upper roller 201 was controlled when detected by temperature sensor S, and it was maintained in the predetermined temperature requirement, and adhered by joining of a toner is carried out by the pressure welding of a cleaning roller 203. This cleaning roller 203 is exchanged for a new thing by about 40,000 print number of sheets. Moreover, if the time amount which is not used exceeds predetermined time, it will become SLEEP mode and energy-saving control of the fixing heater will be carried out.

[0043] When using the transparency furthermore used for OHP as imprint material, a silicone oil is applied to a roller front face with the oil pad 204 of the peripheral surface of an upper roller 201 from the object which graduates the toner image surface and prevents scattered reflection in order to improve the permeability of the toner image of a color.

[0044] Therefore, by making the bearer rate of imprint material switchable at the three-stage of 100 mm/sec, 50 mm/sec, and 12.5 mm/sec, the equipment of this example is equipped with the mode which can use a regular paper, an envelope, and three sorts of imprint material of transparency, and is used corresponding to a broad use.

[0045] In addition, the laying temperature of an upper roller 201 can form low temperature about 180-degree-C order by using the toner fused at low temperature, and by using sponge material (porosity PTFE coat) for the oil pad 204, press nonuniformity is canceled and uniform oil spreading is realized.

[0046] The above is the outline configuration of the image formation equipment in this example.

[0047] Next, the control circuit of image formation equipment is explained.

[0048] Drawing 2 is the block diagram showing the control circuit in the image formation equipment of this example, and drawing 3 is the perspective diagram showing the arrangement condition of the image concentration sensor C.

[0049] As shown in drawing 2, a control circuit 200 A microprocessor 210 (below, it is called MPU for short) and A/D converter 250. The program for electrification control RAM220 and PWM control which were written in RAM240 which wrote in the program module for performing the electrostatic photograph process of RAM230 and others which wrote in the program module to perform, and RAM which wrote in the program which constitutes a development nature fixed means (not shown). It has RAM which wrote in the program which constitutes a printer property detection means and the highest image concentration conversion means. MPU210 is connected to the solenoid for driving a churning screw through the driver (not shown).

[0050] A printer property detection means is constituted from RAM230 which wrote in the image concentration sensors C and MPU210 and the test patch signal SG, and detects the highest image concentration from a actual printer property and it. The program concerned also includes the program equivalent to the highest image concentration conversion means.

[0051] The program equivalent to an image concentration detection means By carrying out A/D conversion of the luminance signal It is what acquires an image concentration signal in consideration of the difference with the concentration of the image support 10, and the concentration of a transfer paper to the value which carried out logarithmic transformation of the ratio with the rated maximum output (output in the condition that nothing adheres on image support) of the image concentration sensor C to the output voltage normalized to 256 gradation. The value which performed and averaged predetermined processing to the luminance signal acquired from two or more patch images which developed on the image support 10 in order to remove the detection error resulting from the oscillation produced during the revolution of the image support 10 is computed (refer to JP,1-41375,A). By this, MPU210 can detect the printer property and the maximum image concentration which removed the detection error resulting from the oscillation of the image support 10.

[0052] MPU210 be a toner concentration control system which control toner concentration by change of permeability uniformly regardless of development nature, and since it be influence by change of the sensitivity property of a sensitization layer like a means to detect the amount of development of image support optically, it collateralize the development nature in the reversal development method uniformly by carry out adjustable [of the rotational frequency of the development sleeve 141].

[0053] A toner concentration control means detects the permeability of the developer with which it loaded into development counter 14A - 14D by the toner concentration sensor TS, and when this drives a toner makeup unit (not shown), it controls toner concentration to abbreviation regularity.

[0054] The program which constitutes a development nature fixed means by controlling the rotational frequency of the development sleeve 141 according to the patch toner image 1 which developed on the image support 10 By obtaining the development nature beyond the sensitization property of a sensitization layer, and controlling uniformly the toner concentration which is closely related to development nature The amount of the developer which controls the rotational frequency of the development sleeve 141 and adheres in the development field of image support 10 front face is changed, and the maximum image concentration is adjusted. The program which constitutes a development nature fixed means contains the device and control program which control the toner concentration in a developer tank uniformly, when adopting a two component developer. A/D converter 250 has connected the image concentration sensor C through amplifier 251. Amplifier 251 amplifies the output level from the image concentration sensor C on the driver voltage level of a microprocessor 210.

[0055] The image concentration sensor C forms in Casing CK a slot which makes the angle whose centers of the light-receiving side of the light emitting diode LED (light emitting diode LN66, the Kagoshima Matsushita electronic incorporated company make) and the photo transistor PT (the photo transistor PN 101, the Kagoshima Matsushita electronic incorporated company make) which emit light in infrared light are 40 degrees and 40 degrees, as shown in drawing 3, and it inserts it in light emitting diode PD and a photo transistor PT in the slot concerned. The whole surface of Casing CK is prepared from image support 10 front face in the 6mm gap so that it may become level on the front face of the image support 10 and the center of the image support 10 may be countered near the cleaning unit 22. The image concentration sensor C constitutes phot coupling from light emitting diode LED and a photo transistor PT. Adjustable DC power supply Vref (not shown) of the maximum output 10 (V) are connected to the anode terminal of light emitting diode LED, and the semipermanent resistance element VR 1 (not shown) and the fixed-resistance element R8 (not shown) which can be switched to 1k (omega) and 2k (omega) are connected to the cathode terminal of light emitting diode LED. By making it such a configuration, adjustable [of the output voltage of adjustable DC power supply Vref] is carried out, and the luminescence reinforcement of light emitting diode LED is adjusted. DC power supply VDC of 10V are connected to the anode terminal of a photo transistor PT, and the output detector which consists of an operational amplifier IC (not shown) and fixed-resistance elements R5 and R6 (not shown) is established in the cathode terminal. Such a configuration detects the voltage according to the optical reinforcement which received light by phot galvanized iron JISUTA PT. It enables it to have received by this the light reflected from a toner image efficiently.

[0056] In addition, the decision method of the luminescence quantity of light of light emitting diode LED which constitutes the image concentration sensor C determines that it is set to V0 by the output voltage from the photo transistor PT which received the light which emits light and reflects light emitting diode LED from the image support 10 (condition that a toner has not adhered). The dirt of the protection-against-dust glass (not shown) which

constitutes the image concentration sensor C by this, and image support 10 front face can be amended.

[0057] It is the mechanical configuration and electric configuration in image formation equipment of the above this example.

[0058] Here, the patch image adopted by this example is explained.

[0059] Drawing 4 is the mimetic diagram which expanded the patch image formed on image support.

[0060] A patch image is preceded with original image formation, and forms two or more patch images (refer to drawing 4) constituted with the toner image of line breadth with which each differed on the image support 10.

[0061] In drawing 4, the arrow head shows the hand of cut of the image support 10, and the slash shows that the toner has adhered. The condition of drawing 4 (a) having shown five patch images, having fixed line breadth of the line which forms a patch image by 50 micrometers, and carrying out sequential change of the gap of 50 micrometers of a line, 75 micrometers, 100 micrometers, 125 micrometers, and the 150 micrometers is shown. Drawing 4 (b) shows five patch images, and the condition of having changed the line breadth of the line which forms a patch image so that it might become thin one by one with 100%, 80%, 60%, 40%, and 20% is shown. Actuation fundamental also in the monochrome of specification [the toner line image which forms the patch image concerned also in which patch image], or the secondary color which piled up two colors is the same. As for the thinnest thing of line breadth, in the toner line image which constitutes a patch image, it is desirable to set it as the size which does not overlap the toner image which adjoined each other even if it took all fluctuation expected into consideration. Even if the thickest thing of line breadth takes all fluctuation expected into consideration, it is desirable to set it as the size which overlaps the toner image which always adjoined each other. Moreover, as for the magnitude of a patch image, it is desirable to make it larger than the measuring range of a sensor in order to secure sensitivity.

[0062] Each of drawing 6 and drawing 7 is graphs which show the relation between reflection density and line spacing.

[0063] The graph shown in drawing 6 and drawing 7 shows the relation of the reflection density and pulse width which are obtained from the patch image shown in drawing 4 (a). The graph shown in drawing 7 shows the case where concentration is highly measured with dirt. In any case, it turns out that point of inflection b exists. Since the regular reflection from the patch image shown in drawing 4 (a) is larger than the echo from a toner 10 or more times, in the process in which a toner image covers the front face of the image support 10, and goes like the field 1 of drawing 6, its change is large. After a toner image covers all image support 10 front faces, it is shown that the change by the layer of a toner increasing turns into a loose change at the business of the field 2 of drawing 6.

[0064] Each of drawing 8 and drawing 9 is graphs which show the relation between reflection density and pulse width.

[0065] The graph shown in drawing 8 and drawing 9 shows the relation of the reflection density and pulse width which are obtained from the patch image shown in drawing 4 (b). The graph shown in drawing 9 shows the case where there is sensitivity change of the image support by the environmental variation or secular change, from the graph shown in drawing 8. In any case, it turns out that point of inflection a exists. Since the regular reflection from the patch image shown in drawing 4 (b) is larger than the echo from a toner 10 or more times, in the process in which a toner image covers the front face of the image support 10, and goes like the field 1 of drawing 8, its change is large. After a toner image covers all image support 10 front faces, it is shown that the change by the layer of a toner increasing turns into a loose change at the business of the field 2 of drawing 8.

[0066] Next, the line breadth control method in the image formation equipment of this example is explained.

[0067] Image formation equipment explains setting-out processing of the rotational frequency of the development sleeve 141 for obtaining the desired highest image concentration (1.4).

[0068] An operator sends out a copy initiation command to MPU210 from a control panel (not shown). MPU210 detects the phase of the image support 10 with the phasing signal outputted from an encoder (not shown), and rotates the image support 10 in the **** direction (reference, such as drawing 1) from the phase. MPU210 impresses predetermined output voltage to the electrification machine 12 from a high voltage power supply (not shown), and thereby, the electrification machine 12 starts discharge and is uniformly charged in the image formation field of the image support 10. Then, the output voltage of the source Vref of direct-current good transformation is set up so that it may be set to 7 (V) with the sensor output in the portion which changes the output voltage of adjustable DC power supply Vref to light emitting diode LED (refer to drawing 4) which constitutes the image concentration sensor C, and does not have a toner patch. It is made to oscillate with this applied voltage, and infrared light is irradiated at the image support 10. A patch image is formed on the image support 10. The exposure level at the time of creating a patch image at this time uses PWM255 which is the maximum light exposure. Thus, the created latent image is developed with the development sleeve 141 of a different rotational frequency. The rotational frequency of the development sleeve 141 is raised to 450rpm every 25rpm from 100rpm. And two or more patch images then created are read by the image concentration sensor C. It means that the rotational frequency of the development sleeve 141 is fixed when the output value read to sensor output 1.5V which are equivalent to 1.4 by fixation image concentration (Macbeth image concentration meter activity) becomes coincidence or an output not more than it, and the printer had secured 1.4 or more by the maximum image concentration. In addition, although based also on the properties (the amount of charges, toner concentration, fluidity, etc.) of a developer, and the surface potential property of a sensitization layer, the rotational frequency of the development sleeve 141 is fixed to about 225 rpm (the ratio of development sleeve lead ** / image support linear velocity is about 1.60) in ordinary temperature normal relative humidity (an equivalent for 20-degree-C50%RH).

[0069] MPU210 performs line breadth measurement processing which showed the width of face of a linear toner

image in drawing 4 (b) in which it asks for line breadth indirectly from the reflection density of a patch image, following decision actuation of the rotational frequency of the development sleeve 141 mentioned above.

[0070] Specifically, MPU210 is sent out to the Pulse-Density-Modulation circuit (not shown) which constitutes write-in equipment 13 for a patch signal from RAM230 which constitutes an PWM control means. A Pulse-Density-Modulation circuit (not shown) sends out the modulating signal which carried out Pulse Density Modulation of the patch signal for 1 scan line to LD actuation circuit (not shown). LD actuation circuit — a modulating signal — semiconductor laser — oscillation **** — a laser beam is irradiated by things. It is made to deviate by the polygon mirror which rotates this laser beam at predetermined speed, and by ftheta lens, the 1st cylindrical lens, and the 2nd cylindrical lens, on the image support 10, it extracts to a minute spot and scans. The above latent-image formation actuation is repeated the number of predetermined times. MPU210 drives development counters 14A-14D in the location which synchronized with the electrostatic latent image, after detecting the phase of the image support 10 from the phasing signal sent out from an encoder (not shown), if termination of latent-image formation actuation is detected. Thereby, the latent image currently formed on the image support 10 develops two or more patch images shown in drawing 4.

[0071] MPU210 detects the phase of the image support 10 from the phasing signal from an encoder, and it sets up the output voltage of the source Vref of direct-current good transformation so that the sensor output in the portion which changes the output voltage of adjustable DC power supply Vref to light emitting diode LED (refer to drawing 3) which constitutes the image concentration sensor C, and does not have a toner patch may be set to 7 (V). It is made to oscillate with this applied voltage, and infrared light is irradiated at the image support 10. Thereby, the photo transistor PT which constitutes the image concentration sensor C sends out the sensor output according to the optical reinforcement reflected from the patch image which developed on the image support 10 to MPU210 through A/D converter 251.

[0072] If the sensor output obtained from the patch image which developed 5.8 (V) Becomes, since the maximum output of a sensor will be 7V, MPU210 is image concentration. — Data is made up for and it is interpolating because 32 data of PWM 0-248 interpolates an operation like $\log 5.8 (V) / 7 (V)$. The method of the interpolation concerned may adopt the method of common knowledge, such as a straight-line spline and the Lagrange straight line, or a interpolation method original with a layout top. Here, interpolation by the cubic spline function was performed (Kyoiku Shuppan: refer to a spline function and its application).

[0073] Since it fixed to 1.4 at the rotational frequency of the development sleeve 141, the maximum image concentration is the concentration operation value of the sensor output of the PWM level 255. — \log (the sensor output of PWM255 level / 7 (V)) also needs to be 1.4. Since the sensor output of PWM255 of the sensor output on [PWM / 248] a property of image formation equipment is also almost the same, $-\log$ (the sensor output of PWM248 level / 7 (V)) also needs to be 1.4. Then, a printer property is acquired by normalizing the operation value of the obtained concentration by 1.4 of the maximum image concentration. However, since the image concentration on a transfer paper with the actual concentration of PWM0 has the concentration of a transfer paper, = (fixation image concentration got by the concentration meter) (concentration of the patch toner image on the image support obtained from a sensor output) is obtained by applying the concentration of a transfer paper to the acquired concentration operation value. In addition, you may make it MPU210 raise detection precision by reading two or more times to a patch image, and averaging the value.

[0074] Even if it changes and prints line width of face, it is necessary to determine the line width of face which has neither alphabetic character crushing nor alphabetic character **** by viewing, and generally in Japan using the kanji with many stroke counts, it is about 120 micrometers. Image formation equipments, such as a printer, are adjusted by electrification potential and the width of face of PWM so that it may become 120 micrometers by the standard operating environment in a shipment phase. However, the image reproduced to imprint material produces change to concentration and line width of face by aging of the image support 10 or a developer, and environmental change. Therefore, it is necessary to adjust electrification potential and PWM and to reset to initial value by measuring concentration and line width of face before a power up or printing initiation.

[0075] In the image formation equipment of this example, in order to consider as a good quality of printed character, MPU210 measures printing concentration, resets and sets a line pitch to 120 micrometers of initial value to initial value continuously, carries out sequential change of the PWM value, and it asks for point of inflection. That is, MPU210 asks for the intersection of the tangent of a parabola shown in drawing 8 as point of inflection a. The line breadth and the pitch of a toner image recognize as an equal the point of inflection a which calculated MPU210 as mentioned above. MPU210 calculates ** with the pulse width used for the patch image formation for obtaining the image concentration obtained as mentioned above. MPU210 computes the optimal pulse width from said point of inflection a.

[0076] Here, it depends for the calculation precision of point of inflection a only on the index signal for controlling the timing of the write-in means 13 of operation. Since the quartz resonator of high degree of accuracy etc. is used in order that the line breadth detection method in this example may acquire a reference signal, the calculation precision of point of inflection a is also maintained at high degree of accuracy. Therefore, since the line breadth measuring method of this example did not measure directly the absolute value or line breadth of reflection density which require high degree of accuracy of the image concentration sensor C but line breadth is detected using the signal of high degree of accuracy like an index signal, even if the line breadth control method in this example is the image concentration sensor C which does not require a high precision, it can detect line breadth using the signal of high degree of accuracy. Moreover, since the mounting precision of the image concentration sensor C of the line

breadth control method in this example may also be rough, the adjustment routing counter of the image concentration sensor C can also be decreased. Moreover, according to the line breadth control method in this example, it is not influenced by the sensitivity lowering by the environmental variation or aging of the image concentration sensor C.

[0077] In addition, although it explained controlling MPU210 to adjust the pulse width signal for forming a latent image by making into initial value the PWM value recognized by the above-mentioned processing, it is not limited to this and you may make it adjust to the grid voltage of the electrification machine 12, the rotational frequency of development counters 14A-14D, and one process conditions of the development bias in this example. Moreover, control action is the same as the above-mentioned explanation about the patch image shown in drawing 4 (a).

[0078]

[Effect of the Invention] The line breadth control method which controls the toner line image which invention of claim 1, claim 3, and four publications detects the line breadth of a toner line image by several micrometers to about 10 micrometers by having the above-mentioned configuration, and is reproduced to predetermined line breadth will be offered. Moreover, since invention of claim 1, claim 3, and four publications has detected line breadth using the signal of high degree of accuracy like an index signal, even if it is an image concentration sensor which is not highly precise, it can detect line breadth using the signal of high degree of accuracy. Moreover, since the mounting precision of the image concentration sensor C of invention of claim 1, claim 3, and four publications may also be rough, the adjustment routing counter of a concentration sensor can also be decreased and it is not influenced by the sensitivity lowering by the environmental variation or aging of a concentration sensor.

[0079] When invention according to claim 2 to 4 is equipped with the above-mentioned configuration, the line breadth control method applicable also to the image formation equipment which adopts a color picture formation process in addition to said effect will be offered.

[0080] When invention according to claim 5 is equipped with the above-mentioned configuration, the line breadth control method which can make sensitivity of a sensor high in addition to the aforementioned effect will be offered.

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TECHNICAL FIELD

[Industrial Application] This invention relates to the line breadth control method of adjusting the line breadth of the line image reproduced in an electrophotography process to predetermined width of face.

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PRIOR ART

[Description of the Prior Art] In the image formation equipment which adopts an electrophotography process, the reproduced line image changes the concentration and line breadth of an image with the temperature of image environment, humidity, image support, the use counts of a developer, etc. In the image formation equipment which forms a toner image by reversal development on image support, the phenomenon of changing the width of face of a linear toner image is explained with reference to drawing 12.

[0003] Drawing 12 is a mimetic diagram explaining the phenomenon of changing the width of face of a linear toner image. Drawing 12 (a) VZ which - (e) takes potential along an axis of ordinate, and length is shown on a horizontal axis, shows the concentration and line breadth of a toner image typically by this, and is shown according to a two-dot chain line shows rest potential. Drawing 12 (a) is the mimetic diagram showing the latent image which carried out image exposure and formed image support after being charged. Drawing 12 (b) shows the portion equivalent to toner coating weight, when the latent image shown in drawing 12 (a) is developed, and the dotted line shows the surface potential of a toner. Drawing 12 (c) is the mimetic diagram showing the latent-image potential at the time of going up from the initial state which rest potential Vz showed to drawing 12 (a) by repeat activity. The alternate long and short dash line in drawing 12 (d) shows the portion equivalent to the toner coating weight when developing the latent image shown in drawing 12 (c). Although it is hardly different from the line breadth of the toner image shown in this field sign 12 (b), it is shown that image concentration falls. Although what controlled and developed development conditions shows by the dotted line and shows that image concentration can be made the same in order to amend lowering of this image concentration, it is shown that line breadth increases. Although there is no change in the maximum image concentration when drawing 12 (e) shows the condition with the loose gamma characteristics of the sensitization layer of image support of having carried out direction change and develops it under these conditions, it is shown that line breadth becomes narrow.

[0004] In order to suppress change of the image concentration and line breadth which were mentioned above, an environmental temperature and humidity are measured, and when temperature is high, detecting and feeding back the line breadth and image concentration of a toner image etc. is performed by measuring amendment of setting up electrification potential more highly, and the reflection density of a toner patch. For this line breadth measurement means, a direct measurement method and an indirect-measurement method can be considered.

[0005] Drawing 10 is the block diagram showing a line breadth measurement means to measure the line breadth of a toner image directly.

[0006] The line breadth measurement means of this direct measurement method can consider detecting the line breadth of a toner image by having the image formation lens L2 which expands and carries out image formation of the light which reflects the light from the light source P from the image formation lens L1 which carries out image formation to the image support Z, and the toner image TG which supported to the image support Z to a photo detector LS, and counting the output signal from a photo detector LS.

[0007] Drawing 11 is the block diagram showing a line breadth measurement means to measure the line breadth of a toner image indirectly.

[0008] The line-breadth measurement means of this indirect-measurement method is equipped with the image-formation lens L3 which reduces and carries out image formation of the light which reflects the light from the light source P from the image-formation lens L1 which carries out image formation to the image support Z, and the toner image TG which supported to the image support Z to a photo detector PD, regards the front face of image support as change of wrap coverage, and detects it as change of the amount of reflected lights by the photo detector PD which has a single light sensing portion. Since the photo detector PD adopted here has a single light sensing portion and it is sufficient for it, it becomes cheaper than a line breadth measurement means to measure direct radiation width of face as shown in drawing 10.

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EFFECT OF THE INVENTION

[Effect of the Invention] The line breadth control method which controls the toner line image which invention of claim 1, claim 3, and four publications detects the line breadth of a toner line image by several micrometers to about 10 micrometers by having the above-mentioned configuration, and is reproduced to predetermined line breadth will be offered. Moreover, since invention of claim 1, claim 3, and four publications has detected line breadth using the signal of high degree of accuracy like an index signal, even if it is an image concentration sensor which is not highly precise, it can detect line breadth using the signal of high degree of accuracy. Moreover, since the mounting precision of the image concentration sensor C of invention of claim 1, claim 3, and four publications may also be rough, the adjustment routing counter of a concentration sensor can also be decreased and it is not influenced by the sensitivity lowering by the environmental variation or aging of a concentration sensor.

[0079] When invention according to claim 2 to 4 is equipped with the above-mentioned configuration, the line breadth control method applicable also to the image formation equipment which adopts a color picture formation process in addition to said effect will be offered.

[0080] When invention according to claim 5 is equipped with the above-mentioned configuration, the line breadth control method which can make sensitivity of a sensor high in addition to the aforementioned effect will be offered.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, in spite of having fed back by amendment of the above-mentioned electrification potential, or measurement of the reflection density of a toner patch, since change of line breadth was as small as several micrometers to about 10 micrometers, there was nothing that can be measured directly with cheap equipment. Since a line breadth measurement means as shown in drawing 10 will specifically need the line sensor formed in the pitch of about severalmicro per pixel in order to detect fluctuation of line breadth with a sufficient precision, and the scale factor of the optical system which consists of a photo detector L2 will need an about 10-time scale factor, it becomes cost high. If the focal distance of the above-mentioned optical system is set to 5mm, since the whole sensor serves as magnitude of 50mm or more, it becomes the magnitude which is hard to include in the image formation equipment in the inclination to miniaturize. On the other hand, since the line breadth measurement means explained with reference to drawing 11 will grasp the toner image as a gestalt for which two or more linear toner images gathered, it cannot distinguish and measure change of line breadth, and change of image concentration. Therefore, even if it adjusted development conditions etc. and has maintained image concentration to predetermined, since the output level from a photo detector PD was related to the line breadth of a toner image, an output will also change with an environmental variation, aging, dirt, etc., and it was not able to amend the error. Moreover, since an absolute precision of a sensor was required of any method, it did not have what can be used being able to incorporate in image formation equipment. Moreover, the circuit for driving a line sensor and the circuit which reads the output signal from a line sensor also become intricately and expensive.

[0010] The object of this invention is to offer the line breadth control method which controls the toner line image which detects the line breadth of a toner line image by several micrometers to about 10 micrometers, and is reproduced to predetermined line breadth in view of the above-mentioned trouble.

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MEANS

[Means for Solving the Problem] There are the following as a means to attain the above-mentioned object.

[0012] (1) A pulse width control process of adjusting a pulse width signal which controls luminescence of the light source, A patch latent-image formation process which forms a patch latent image which consists of two or more line latent images by irradiating light from said light source, A **** process which develops said patch latent image in a patch image which consists of a toner line image, A process which forms two or more patch images with which a **** process is repeated from said pulse width control process, and gradation differs, and a process which measures optical density of said patch image, A line breadth control method which consists of a point-of-inflection detection process of detecting point of inflection in ** of reflection density using an index signal from said toner line image and patch image, and a process condition adjustment process of adjusting conditions of an electrophotography process from data in said point of inflection.

[0013] (2) Said patch image is the line breadth control method of of (1) characterized by piling up two or more colors.

[0014] (3) Said patch image is either line breadth control method of (1) and (2) characterized by changing a gap, setting line breadth of a toner line image as constant.

[0015] (4) Said patch image is either line breadth control method of (1) and (2) characterized by changing line breadth of a toner line image.

[0016] (5) Magnitude of said patch image is either line breadth control method of (1) and (2) characterized by making it larger than measuring range of a sensor, and having carried out.

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EXAMPLE

[Example] Drawing 1 is the outline block diagram showing the image formation equipment of this example, and drawing 5 is a graph which shows the potential property of the image support adopted as the image formation equipment of this example.

[0018] For every revolution of the image support 10, it is based on the electrification machine 12 and the image formation equipment of this example is charged, as shown in drawing 1. The electrostatic latent image whose color was separated on the image support 10 by image exposure by write-in equipment 13 is formed. To the periphery of the image support 10 in order are full color and to reproduce the electrostatic latent image concerned Yellow, Make it operate selectively from the development counters 14A-14D which contained the two component developer which consists of a Magenta, cyanogen, and a black toner and a black carrier, respectively, and it develops in a toner image. By repeating a series of processes which form the toner image concerned in the image support 10 two or more times for every color, after bundling up with the imprint roller 18 to the imprint material sent from a sheet paper cassette 15 after piling up each color toner image on the image support 1 and imprinting to it, it is established with an anchorage device 20.

[0019] The main part housing of image formation equipment is formed from the upright side panel 1 (not shown) and the upright side panel 2 (not shown). The development unit 120 which stores two or more development counters 14A-14D with write-in equipment 13 and the image support 10 among side panels 1 and 2. Furthermore, an anchorage device 20 and a DC power supply unit (not shown) are incorporated. On the other hand, the control board (not shown) for operating-sequence control of a drive system, the formatter (not shown) which decodes a printer command, and a machine is stored in the outside of a side panel 2. Moreover, a toner makeup means 140 to connect with each development counters 14A-14D in the development unit 120 is held in the upper part of the development unit 120.

[0020] The image support 10, the electrification machine 12, and cleaning equipment 22 are incorporated and united with the drum cartridge 130 (not shown), and, on the other hand, each development counters 14A-14D and a toner makeup means (not shown) are incorporated and united with the stand 100 (not shown). A stand 100 is positioned in the location which can perform image formation actuation, or is equipped with the configuration for moving almost horizontally and setting it as the drawer location from the stowed position to the main part of equipment, as shown in drawing 1.

[0021] The guide idler 53 (not shown) is provided so that each inner surface of a side panel 1 and a side panel 2 which forms the main part of equipment may be faced at a upper rail 51 (graphic display ****) and the lower rail 52 (not shown), and on the other hand, it has the plate-like part material 41 which equips the side of the right and left with the rotation roller 42, and the rotation roller 42 is engaged with the guide member 50, and a stand 100 engages plate-like part material 41 the very thing with a guide idler 53, respectively, and supports It is an outline configuration for attaining the function which this mentioned above.

[0022] Below, it is attached to the configuration and function of each part material, and explains.

[0023] The image support 10 on the conductive base material of phi 120 fabricated from the aluminum For example, coating of the under-coating layer of 0.3 micrometers of thickness is carried out with alcoholic fusibility polyimide. Apply the CGL agent which distributed the polyvinyl butyral for Y mold CHITARU phthalocyanine on the under-coating layer concerned, and coating of the CGL of 0.3 micrometers of thickness is carried out. It is the electrophotography photo conductor which carried out coating of the CTL of 25 micrometers of thickness which consists of a polycarbonate and a still triphenylamine system compound, and carried out the laminating of an interlayer and the sensitization layer on the CGL concerned, and has grounded. The encoder (not shown) is formed in the driving shaft 103 of the image support 10, and thereby, MPU210 detects the phase of the image support 10, and has been made to perform the electrophotography process.

[0024] Here, the potential property of the image support 10 is explained with reference to drawing 5.

[0025] The surface potential (- V) of the image support 10 is shown on the axis of ordinate by the graph shown in drawing 5, and the power (mW) of semiconductor laser is shown on the horizontal axis. O The potential property in 20-degree-C50%RH (this may be hereafter called ordinary temperature normal relative humidity NN) is shown, ** shows the potential property in 30-degree-C80%RH (this may be hereafter called high-humidity/temperature HH), and ** shows the potential property in 10-degree-C20%RH (it may be called low-humidity/temperature LL). This graph shows changing the surface potential in the exposure field of the image support 10 with environmental temperature humidity. Here, an exposure field means fields other than initial electrification potential.

[0026] The driving shaft 103 and the revolution of both the flanges 101,102 (not shown) that support image support

10 peripheral surface are enabled, and they form the spring member 105 between the holddown member 104 (not shown) fixed to the driving shaft 103, and one flange 101, and have connected each other with it. When it does in this way, an effect equivalent to having made low rigidity of a drive system which consists of image support 10 and a driving shaft 103 is acquired, a resonant frequency is lowered, and it can avoid resonating with fluctuation of the oscillation from a driver G. And fluctuation of the rotational speed inputted into the driving shaft 103 can be made to be able to absorb by the low rigidity member, and the image support 10 can be rotated, without producing fluctuation of 100 mm/sec linear velocity.

[0027] in order to abolish the hysteresis of the photo conductor to a front print in advance of negative electrification in which the image support 10 was stabilized according [PCL11] to the electrification machine 12 since revolution actuation is carried out by realizing the driving force transfer method with this configuration — light emitting diode etc. — using — exposure — carrying out — the sensitization layer peripheral surface of the image support 10 — discharging electricity. The electrification machine 12 gives uniform electrification of VH-850V by carrying out corona discharge to VG to the peripheral surface of the image support 10 from the corona discharge wire which consists of a grid by which potential maintenance was carried out, and a platinum wire (a clad or alloy).

[0028] Through the polygon mirror 131 and ftheta lens 133 grade which make the laser diode which is not illustrated based on a picture signal after being uniform charged to the sensitization layer of the image support 10 the luminescence light source, and rotate, write-in equipment 13 bends an optical path by the reflective mirror 132, scans, and forms a latent image by the revolution (vertical scanning) of the image support 10. That is, if the image data from a formatter is sent to a laser diode (LD) modulation circuit and a laser diode emits light with the modulated picture signal, the synchronization of each scanning line will be achieved by the beam index 136 (not shown) through a mirror 137 (not shown), and it will be projected on the beam light by the polygon mirror 131. The polygon mirror 131 reflects and scans beam light with the polyhedron, after, as for the scan light, a beam shape is amended by the ftheta lens 133 and the cylindrical lens 134, it exposes a photo conductor through the reflective mirror 132, performs horizontal scanning, and forms an electrostatic image. the polygon mirror 131 — a 6th page mirror — pneumatic bearing adoption of rotational frequency 23600rpm — it carries out. The focal distance of the ftheta lens 133 and cylindrical-lens 134 grade is $f = 140\text{mm}$. Dot clocks are 20MHZ(s). A beam diameter is about 140×100 micrometers. It is latent-image potential VL-50V of this beam diameter.

[0029] In order to obtain a high quality picture, it is necessary to also make particle size of a toner small. In this example, each color is using the toner with a size of 8 micrometers. However, for a user, black alphabetic character quality is the most important and the diameter toner of a granule (7 micrometers - 11 micrometers) is suitable for a black toner. thereby, the print density of image formation equipment also boils *****, it is 12 dot(s)/mm and the dot pitch may be 1/12mm.

[0030] The toner supplied from the toner box (not shown) falls at the right edge of a development counter, and churning mixing is carried out by the churning screw of the couple which rotates in the opposite direction with a carrier, and it is set as the predetermined amount (Q/M) of electrifications by it.

[0031] On the other hand, toner concentration is detected by L *****, controls the amount of supply of a toner based on this output frequency, and setting-out control is carried out at 5 thru/or about 7% of toner concentration value.

[0032] The agitated two component developer is conveyed by the development sleeve 141 through a feed roller 143, it is made a thin layer by thickness specification-part material (not shown), is conveyed two times 20 to 30 mg/cm in the development region of the image support 10, and performs reversal development of an electrostatic latent image according to the development conditions described below.

[0033] as 0.5mm with the larger gap of the development sleeve 141 and the image support 10 in a development region than thickness (developer) — during this period — AC bar of 2kV and 8KHZ — a chair and the DC bias of -750V are overlapped and are impressed. The development sleeve 141 is rotated normally to the image support 10, since electrification of VDC, VH, and a toner is like-pole nature, the toner which was able to give the cause to secede from a carrier does not adhere to the portion of VH with potential higher than VDC, but adheres to VL portion with potential lower than VDC, and development (reversal development) is performed by VAC.

[0034] In addition, it is also possible to enable it to check a residue by looking easily by fabricating a toner bottle with a translucent material at the same time it carries out small simplification of the feeder of a toner by using the toner bottle with which the aforementioned toner box is loaded as a toner hopper as it is, although not illustrated.

[0035] Imprint material (not shown) is stored on single-sided criteria in the sheet paper cassette 15, therefore it sells, and a pawl 151 is inclined and located in the datum-level side of imprint material, being prepared only in the datum-level side of imprint material, and a roller 16 also being further used as a cantilever structure for a half moon.

[0036] The feed section has the motor (not shown) of dedication, deals with the imprint material which the roller 16 rotated and pushed up in the **** direction for a half moon, and was loaded on the board 152, and takes out only one sheet of the maximum upper layer according to an operation of a pawl 151.

[0037] After the imprint material taken out from the sheet paper cassette 15 suspends a motor by detection of the feed sensor which is not illustrated just after close makes a U-turn to a conveyance system way and a head passes the feed roller 17, a motor begins a revolution again in the phase in which the timing of an imprint was ready, and it maintains a predetermined angle to the sensitization stratification plane of the image support 10, and is fed to the imprint region.

[0038] On the other hand, feeding by manual bypass is performed by rotating and setting to the location shown as a

continuous line from the location which shows the manual paper feed base M located in the front face of the main part of equipment with the alternate long and short dash line of drawing 1.

[0039] The paper by which manual bypass was carried out is conveyed by revolution of a pickup roller 153, and is fed to an imprint region through the same process as feeding from the sheet paper cassette 15 mentioned above.

[0040] The papers made into the object of a manual paper feed are the cardboard of 36lbs besides the general imprint material P of 16lbs(es) usually used thru/or 24lbs(es), the transparency for OHP, etc. Moreover, feeding of an envelope is also possible by removing the manual paper feed base M and equipping with the feeder of dedication as an option.

[0041] Although the location to the peripheral surface of the image support 10 is adjustable and is always put on a pressure-welding condition at the time of the print of a monochrome image, the imprint roller 18 is maintained at the location which evacuated during formation of a color picture and was estranged, and a pressure welding is carried out only at the time of an imprint. On the other hand, the separation brush 19 also carries out actuation of a pressure welding and alienation to the peripheral surface of the image support 10 almost synchronizing with location fluctuation of the imprint roller 18. By +3 thru/or 4KVDC(s), the imprint roller 18 of the format which cleans a roller side with a blade is used, and it is used for this imprint roller 18 for the bias voltage which superimposed DC and AC to the separation brush 19 by applied voltage, impressing.

[0042] An anchorage device 20 is the so-called anchorage device of the heat mechanical control by roller which consists of the roller of a couple, carries out heating conveyance of the imprint material P by the nip section which carried out the pressure welding to the upper roller 201 and this upper roller 201 which contain Heater H and carry out an actuation revolution clockwise, and was formed between the lower rollers 202 which carry out a follower revolution, and performs joining of a toner image. Siwa of the space which is easy to produce in case an envelope etc. is conveyed is prevented by each up-and-down roller's of both having the heat-resistant tube covered, and forming the nip section in the shape of a straight line by the pressure welding. Clearance cleaning of the dirt which the peripheral surface temperature of an upper roller 201 was controlled when detected by temperature sensor S, and it was maintained in the predetermined temperature requirement, and adhered by joining of a toner is carried out by the pressure welding of a cleaning roller 203. This cleaning roller 203 is exchanged for a new thing by about 40,000 print number of sheets. Moreover, if the time amount which is not used exceeds predetermined time, it will become SLEEP mode and energy-saving control of the fixing heater will be carried out.

[0043] When using the transparency furthermore used for OHP as imprint material, a silicone oil is applied to a roller front face with the oil pad 204 of the peripheral surface of an upper roller 201 from the object which graduates the toner image surface and prevents scattered reflection in order to improve the permeability of the toner image of a color.

[0044] Therefore, by making the bearer rate of imprint material switchable at the three-stage of 100 mm/sec, 50 mm/sec, and 12.5 mm/sec, the equipment of this example is equipped with the mode which can use a regular paper, an envelope, and three sorts of imprint material of transparency, and is used corresponding to a broad use.

[0045] In addition, the laying temperature of an upper roller 201 can form low temperature about 180-degree-C order by using the toner fused at low temperature, and by using sponge material (porosity PTFE coat) for the oil pad 204, press nonuniformity is canceled and uniform oil spreading is realized.

[0046] The above is the outline configuration of the image formation equipment in this example.

[0047] Next, the control circuit of image formation equipment is explained.

[0048] Drawing 2 is the block diagram showing the control circuit in the image formation equipment of this example, and drawing 3 is the perspective diagram showing the arrangement condition of the image concentration sensor C.

[0049] As shown in drawing 2, a control circuit 200 A microprocessor 210 (below, it is called MPU for short) and A/D converter 250, The program for electrification control RAM220 and PWM control which were written in RAM240 which wrote in the program module for performing the electrostatic photograph process of RAM230 and others which wrote in the program module to perform, and RAM which wrote in the program which constitutes a development nature fixed means (not shown). It has RAM which wrote in the program which constitutes a printer property detection means and the highest image concentration conversion means. MPU210 is connected to the solenoid for driving a churning screw through the driver (not shown).

[0050] A printer property detection means is constituted from RAM230 which wrote in the image concentration sensors C and MPU210 and the test patch signal SG, and detects the highest image concentration from a actual printer property and it. The program concerned also includes the program equivalent to the highest image concentration conversion means.

[0051] The program equivalent to an image concentration detection means By carrying out A/D conversion of the luminance signal It is what acquires an image concentration signal in consideration of the difference with the concentration of the image support 10, and the concentration of a transfer paper to the value which carried out logarithmic transformation of the ratio with the rated maximum output (output in the condition that nothing adheres on image support) of the image concentration sensor C to the output voltage normalized to 256 gradation. The value which performed and averaged predetermined processing to the luminance signal acquired from two or more patch images which developed on the image support 10 in order to remove the detection error resulting from the oscillation produced during the revolution of the image support 10 is computed (refer to JP,1-41375,A). By this, MPU210 can detect the printer property and the maximum image concentration which removed the detection error resulting from the oscillation of the image support 10.

[0052] MPU210 be a toner concentration control system which control toner concentration by change of

permeability uniformly regardless of development nature, and since it be influence by change of the sensitivity property of a sensitization layer like a means to detect the amount of development of image support optically, it collateralize the development nature in the reversal development method uniformly by carry out adjustable [of the rotational frequency of the development sleeve 141].

[0053] A toner concentration control means detects the permeability of the developer with which it loaded into development counter 14A - 14D by the toner concentration sensor TS, and when this drives a toner makeup unit (not shown), it controls toner concentration to abbreviation regularity.

[0054] The program which constitutes a development nature fixed means by controlling the rotational frequency of the development sleeve 141 according to the patch toner image 1 which developed on the image support 10 By obtaining the development nature beyond the sensitization property of a sensitization layer, and controlling uniformly the toner concentration which is closely related to development nature The amount of the developer which controls the rotational frequency of the development sleeve 141 and adheres in the development field of image support 10 front face is changed, and the maximum image concentration is adjusted. The program which constitutes a development nature fixed means contains the device and control program which control the toner concentration in a developer tank uniformly, when adopting a two component developer. A/D converter 250 has connected the image concentration sensor C through amplifier 251. Amplifier 251 amplifies the output level from the image concentration sensor C on the driver voltage level of a microprocessor 210.

[0055] The image concentration sensor C forms in Casing CK a slot which makes the angle whose centers of the light-receiving side of the light emitting diode LED (light emitting diode LN66, the Kagoshima Matsushita electronic incorporated company make) and the photo transistor PT (the photo transistor PN 101, the Kagoshima Matsushita electronic incorporated company make) which emit light in infrared light are 40 degrees and 40 degrees, as shown in drawing 3 , and it inserts it in light emitting diode PD and a photo transistor PT in the slot concerned. The whole surface of Casing CK is prepared from image support 10 front face in the 6mm gap so that it may become level on the front face of the image support 10 and the center of the image support 10 may be countered near the cleaning unit 22. The image concentration sensor C constitutes phot coupling from light emitting diode LED and a photo transistor PT. Adjustable DC power supply Vref (not shown) of the maximum output 10 (V) are connected to the anode terminal of light emitting diode LED, and the semipermanent resistance element VR 1 (not shown) and the fixed-resistance element R8 (not shown) which can be switched to 1k (omega) and 2k (omega) are connected to the cathode terminal of light emitting diode LED. By making it such a configuration, adjustable [of the output voltage of adjustable DC power supply Vref] is carried out, and the luminescence reinforcement of light emitting diode LED is adjusted. DC power supply VDC of 10V are connected to the anode terminal of a photo transistor PT, and the output detector which consists of an operational amplifier IC (not shown) and fixed-resistance elements R5 and R6 (not shown) is established in the cathode terminal. Such a configuration detects the voltage according to the optical reinforcement which received light by phot galvanized iron JISUTA PT. It enables it to have received by this the light reflected from a toner image efficiently.

[0056] In addition, the decision method of the luminescence quantity of light of light emitting diode LED which constitutes the image concentration sensor C determines that it is set to V0 by the output voltage from the photo transistor PT which received the light which emits light and reflects light emitting diode LED from the image support 10 (condition that a toner has not adhered). The dirt of the protection-against-dust glass (not shown) which constitutes the image concentration sensor C by this, and image support 10 front face can be amended.

[0057] It is the mechanical configuration and electric configuration in image formation equipment of the above this example.

[0058] Here, the patch image adopted by this example is explained.

[0059] Drawing 4 is the mimetic diagram which expanded the patch image formed on image support.

[0060] A patch image is preceded with original image formation, and forms two or more patch images (refer to drawing 4) constituted with the toner image of line breadth with which each differed on the image support 10.

[0061] In drawing 4 , the arrow head shows the hand of cut of the image support 10, and the slash shows that the toner has adhered. The condition of drawing 4 (a) having shown five patch images, having fixed line breadth of the line which forms a patch image by 50 micrometers, and carrying out sequential change of the gap of 50 micrometers of a line, 75 micrometers, 100 micrometers, 125 micrometers, and the 150 micrometers is shown. Drawing 4 (b) shows five patch images, and the condition of having changed the line breadth of the line which forms a patch image so that it might become thin one by one with 100%, 80%, 60%, 40%, and 20% is shown. Actuation fundamental also in the monochrome of specification [the toner line image which forms the patch image concerned also in which patch image], or the secondary color which piled up two colors is the same. As for the thinnest thing of line breadth, in the toner line image which constitutes a patch image, it is desirable to set it as the size which does not overlap the toner image which adjoined each other even if it took all fluctuation expected into consideration. Even if the thickest thing of line breadth takes all fluctuation expected into consideration, it is desirable to set it as the size which overlaps the toner image which always adjoined each other. Moreover, as for the magnitude of a patch image, it is desirable to make it larger than the measuring range of a sensor in order to secure sensitivity.

[0062] Each of drawing 6 and drawing 7 is graphs which show the relation between reflection density and line spacing.

[0063] The graph shown in drawing 6 and drawing 7 shows the relation of the reflection density and pulse width which are obtained from the patch image shown in drawing 4 (a). The graph shown in drawing 7 shows the case where concentration is highly measured with dirt. In any case, it turns out that point of inflection b exists. Since the

regular reflection from the patch image shown in drawing 4 (a) is larger than the echo from a toner 10 or more times, in the process in which a toner image covers the front face of the image support 10, and goes like the field 1 of drawing 6, its change is large. After a toner image covers all image support 10 front faces, it is shown that the change by the layer of a toner increasing turns into a loose change at the business of the field 2 of drawing 6. [0064] Each of drawing 8 and drawing 9 is graphs which show the relation between reflection density and pulse width.

[0065] The graph shown in drawing 8 and drawing 9 shows the relation of the reflection density and pulse width which are obtained from the patch image shown in drawing 4 (b). The graph shown in drawing 9 shows the case where there is sensitivity change of the image support by the environmental variation or secular change, from the graph shown in drawing 8. In any case, it turns out that point of inflection exists. Since the regular reflection from the patch image shown in drawing 4 (b) is larger than the echo from a toner 10 or more times, in the process in which a toner image covers the front face of the image support 10, and goes like the field 1 of drawing 8, its change is large. After a toner image covers all image support 10 front faces, it is shown that the change by the layer of a toner increasing turns into a loose change at the business of the field 2 of drawing 8.

[0066] Next, the line breadth control method in the image formation equipment of this example is explained.

[0067] Image formation equipment explains setting-out processing of the rotational frequency of the development sleeve 141 for obtaining the desired highest image concentration (1.4).

[0068] An operator sends out a copy initiation command to MPU210 from a control panel (not shown). MPU210 detects the phase of the image support 10 with the phasing signal outputted from an encoder (not shown), and rotates the image support 10 in the **** direction (reference, such as drawing 1) from the phase. MPU210 impresses predetermined output voltage to the electrification machine 12 from a high voltage power supply (not shown); and thereby, the electrification machine 12 starts discharge and is uniformly charged in the image formation field of the image support 10. Then, the output voltage of the source Vref of direct-current good transformation is set up so that it may be set to 7 (V) with the sensor output in the portion which changes the output voltage of adjustable DC power supply Vref to light emitting diode LED (refer to drawing 4) which constitutes the image concentration sensor C, and does not have a toner patch. It is made to oscillate with this applied voltage, and infrared light is irradiated at the image support 10. A patch image is formed on the image support 10. The exposure level at the time of creating a patch image at this time uses PWM255 which is the maximum light exposure. Thus, the created latent image is developed with the development sleeve 141 of a different rotational frequency. The rotational frequency of the development sleeve 141 is raised to 450rpm every 25rpm from 100rpm. And two or more patch images then created are read by the image concentration sensor C. It means that the rotational frequency of the development sleeve 141 is fixed when the output value read to sensor output 1.5V which are equivalent to 1.4 by fixation image concentration (Macbeth image concentration meter activity) becomes coincidence or an output not more than it, and the printer had secured 1.4 or more by the maximum image concentration. In addition, although based also on the properties (the amount of charges, toner concentration, fluidity, etc.) of a developer, and the surface potential property of a sensitization layer, the rotational frequency of the development sleeve 141 is fixed to about 225 rpm (the ratio of development sleeve lead ** / image support linear velocity is about 1.60) in ordinary temperature normal relative humidity (an equivalent for 20-degree-C50%RH).

[0069] MPU210 performs line breadth measurement processing which showed the width of face of a linear toner image in drawing 4 (b) in which it asks for line breadth indirectly from the reflection density of a patch image, following decision actuation of the rotational frequency of the development sleeve 141 mentioned above.

[0070] Specifically, MPU210 is sent out to the Pulse-Density-Modulation circuit (not shown) which constitutes write-in equipment 13 for a patch signal from RAM230 which constitutes a PWM control means. A Pulse-Density-Modulation circuit (not shown) sends out the modulating signal which carried out Pulse Density Modulation of the patch signal for 1 scan line to LD actuation circuit (not shown). LD actuation circuit — a modulating signal — semiconductor laser — oscillation **** — a laser beam is irradiated by things. It is made to deviate by the polygon mirror which rotates this laser beam at predetermined speed, and by ftheta lens, the 1st cylindrical lens, and the 2nd cylindrical lens, on the image support 10, it extracts to a minute spot and scans. The above latent-image formation actuation is repeated the number of predetermined times. MPU210 drives development counters 14A-14D in the location which synchronized with the electrostatic latent image, after detecting the phase of the image support 10 from the phasing signal sent out from an encoder (not shown), if termination of latent-image formation actuation is detected. Thereby, the latent image currently formed on the image support 10 develops two or more patch images shown in drawing 4.

[0071] MPU210 detects the phase of the image support 10 from the phasing signal from an encoder, and it sets up the output voltage of the source Vref of direct-current good transformation so that the sensor output in the portion which changes the output voltage of adjustable DC power supply Vref to light emitting diode LED (refer to drawing 3) which constitutes the image concentration sensor C, and does not have a toner patch may be set to 7 (V). It is made to oscillate with this applied voltage, and infrared light is irradiated at the image support 10. Thereby, the photo transistor PT which constitutes the image concentration sensor C sends out the sensor output according to the optical reinforcement reflected from the patch image which developed on the image support 10 to MPU210 through A/D converter 251.

[0072] If the sensor output obtained from the patch image which developed 5.8 (V) Becomes, since the maximum output of a sensor will be 7V, MPU210 is image concentration. - Data is made up for and it is interpolating because 32 data of PWM 0-248 interpolates an operation like $\log 5.8 (V) / 7 (V)$. The method of the interpolation concerned

may adopt the method of common knowledge, such as a straight-line spline and the Lagrange straight line, or a interpolation method original with a layout top. Here, interpolation by the cubic spline function was performed (Kyoiku Shuppan: refer to a spline function and its application).

[0073] Since it fixed to 1.4 at the rotational frequency of the development sleeve 141, the maximum image concentration is the concentration operation value of the sensor output of the PWM level 255. $-\log$ (the sensor output of PWM255 level / 7 (V)) also needs to be 1.4. Since the sensor output of PWM255 of the sensor output on [PWM / 248] a property of image formation equipment is also almost the same, $-\log$ (the sensor output of PWM248 level / 7 (V)) also needs to be 1.4. Then, a printer property is acquired by normalizing the operation value of the obtained concentration by 1.4 of the maximum image concentration. However, since the image concentration on a transfer paper with the actual concentration of PWM0 has the concentration of a transfer paper, = (fixation image concentration got by the concentration meter) (concentration of the patch toner image on the image support obtained from a sensor output) is obtained by applying the concentration of a transfer paper to the acquired concentration operation value. In addition, you may make it MPU210 raise detection precision by reading two or more times to a patch image, and averaging the value.

[0074] Even if it changes and prints line width of face, it is necessary to determine the line width of face which has neither alphabetic character crushing nor alphabetic character **** by viewing, and generally in Japan using the kanji with many stroke counts, it is about 120 micrometers. Image formation equipments, such as a printer, are adjusted by electrification potential and the width of face of PWM so that it may become 120 micrometers by the standard operating environment in a shipment phase. However, the image reproduced to imprint material produces change to concentration and line width of face by aging of the image support 10 or a developer, and environmental change. Therefore, it is necessary to adjust electrification potential and PWM and to reset to initial value by measuring concentration and line width of face before a power up or printing initiation.

[0075] In the image formation equipment of this example, in order to consider as a good quality of printed character, MPU210 measures printing concentration, resets and sets a line pitch to 120 micrometers of initial value to initial value continuously, carries out sequential change of the PWM value, and it asks for point of inflection. That is, MPU210 asks for the intersection of the tangent of a parabola shown in drawing 8 as point of inflection a. The line breadth and the pitch of a toner image recognize as an equal the point of inflection a which calculated MPU210 as mentioned above. MPU210 calculates ** with the pulse width used for the patch image formation for obtaining the image concentration obtained as mentioned above. MPU210 computes the optimal pulse width from said point of inflection a.

[0076] Here, it depends for the calculation precision of point of inflection a only on the index signal for controlling the timing of the write-in means 13 of operation. Since the quartz resonator of high degree of accuracy etc. is used in order that the line breadth detection method in this example may acquire a reference signal, the calculation precision of point of inflection a is also maintained at high degree of accuracy. Therefore, since the line breadth measuring method of this example did not measure directly the absolute value or line breadth of reflection density which require high degree of accuracy of the image concentration sensor C but line breadth is detected using the signal of high degree of accuracy like an index signal, even if the line breadth control method in this example is the image concentration sensor C which does not require a high precision, it can detect line breadth using the signal of high degree of accuracy. Moreover, since the mounting precision of the image concentration sensor C of the line breadth control method in this example may also be rough, the adjustment routing counter of the image concentration sensor C can also be decreased. Moreover, according to the line breadth control method in this example, it is not influenced by the sensitivity lowering by the environmental variation or aging of the image concentration sensor C.

[0077] In addition, although it explained controlling MPU210 to adjust the pulse width signal for forming a latent image by making into initial value the PWM value recognized by the above-mentioned processing, it is not limited to this and you may make it adjust to the grid voltage of the electrification machine 12, the rotational frequency of development counters 14A-14D, and one process conditions of the development bias in this example. Moreover, control action is the same as the above-mentioned explanation about the patch image shown in drawing 4 (a).

[Translation done.]

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- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram showing the image formation equipment of this example.

[Drawing 2] It is the block diagram showing the control circuit in the image formation equipment of this example.

[Drawing 3] It is the perspective diagram showing the arrangement condition of the image concentration sensor C.

[Drawing 4] It is the mimetic diagram which expanded the patch image formed on image support.

[Drawing 5] It is the graph which shows the potential property of the image support adopted as the image formation equipment of this example.

[Drawing 6] It is the graph which shows the relation between reflection density and line spacing.

[Drawing 7] It is the graph which shows the relation between reflection density and line spacing.

[Drawing 8] It is the graph which shows the relation between reflection density and pulse width.

[Drawing 9] It is the graph which shows the relation between reflection density and pulse width.

[Drawing 10] It is the block diagram showing a line breadth measurement means to measure the line breadth of a toner image directly.

[Drawing 11] It is the block diagram showing a line breadth measurement means to measure the line breadth of a toner image indirectly.

[Drawing 12] It is a mimetic diagram explaining the phenomenon of changing the width of face of a linear toner image.

[Description of Notations]

10 Image Support

12 Electrification Machine

13 Write-in Equipment

14A-14D Development counter

C Image concentration sensor

[Translation done.]

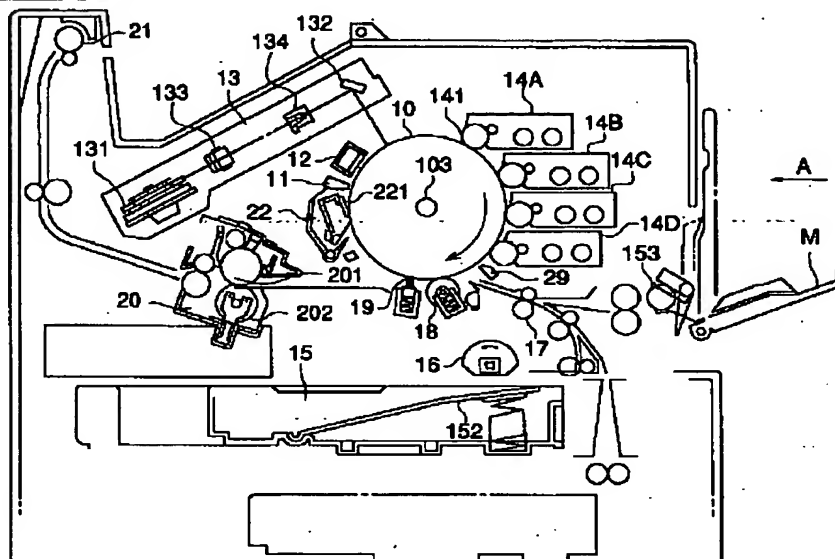
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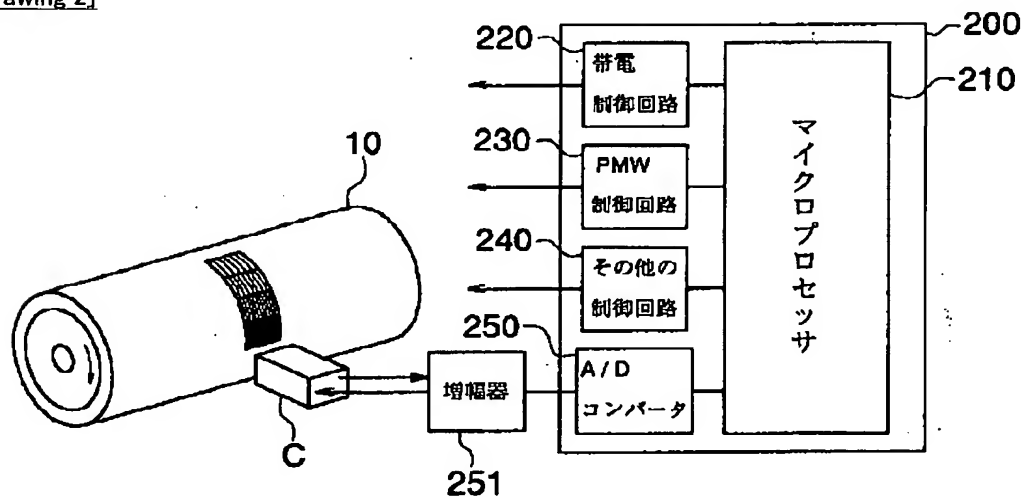
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DRAWINGS

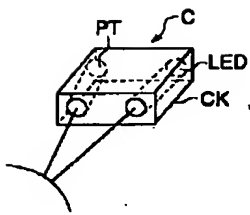
[Drawing 1]



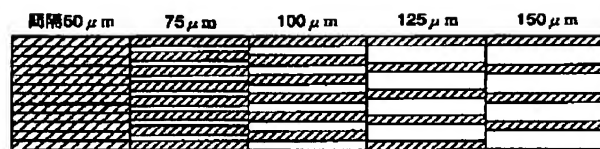
[Drawing 2]



[Drawing 3]

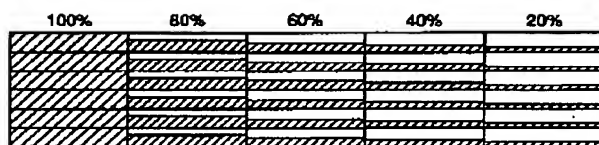


[Drawing 4]
(a)



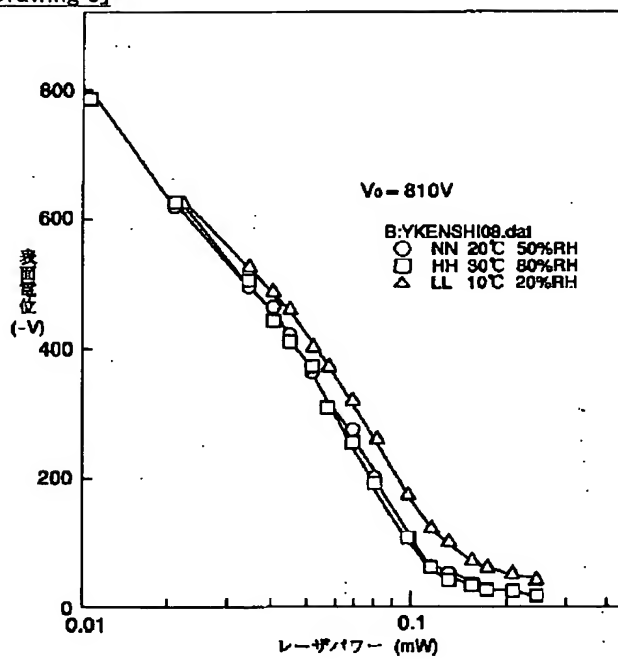
回転方向

(b)

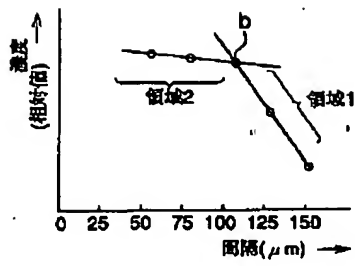


回転方向

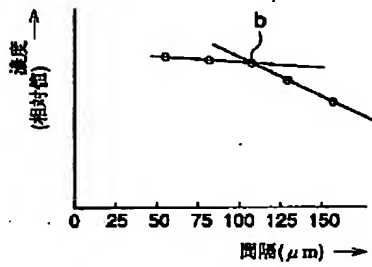
[Drawing 5]



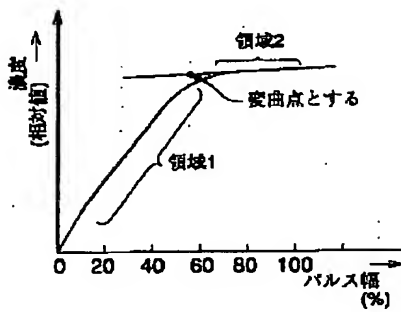
[Drawing 6]



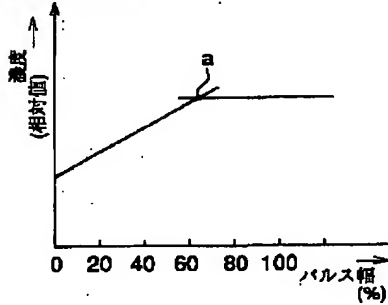
[Drawing 7]



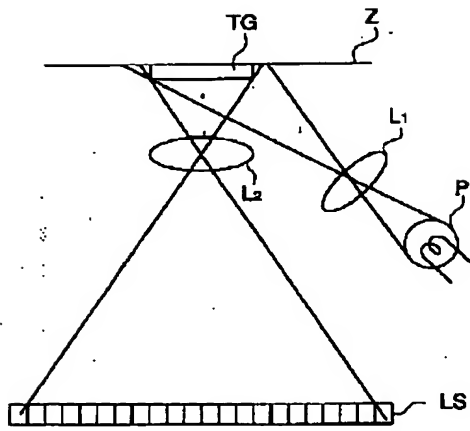
[Drawing 8]



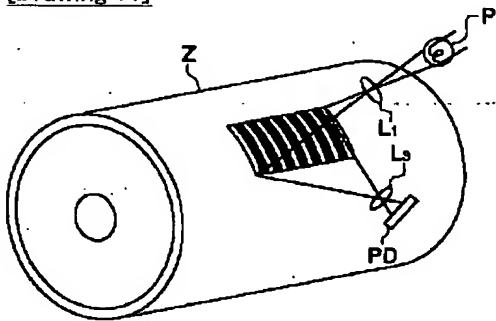
[Drawing 9]



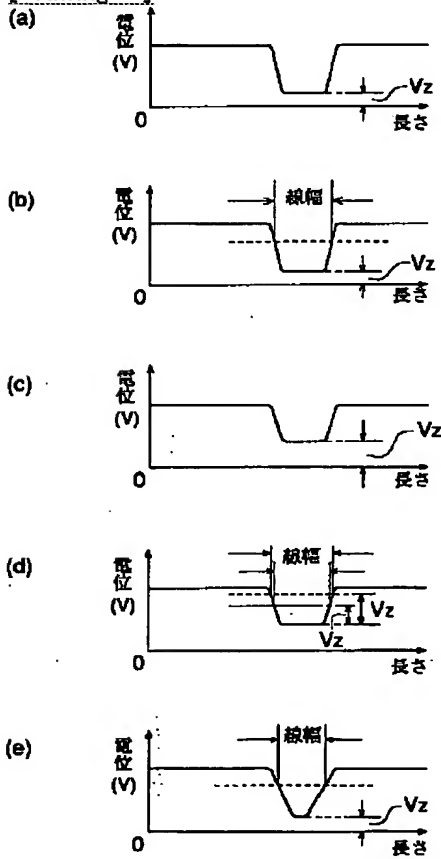
[Drawing 10]



[Drawing 11]



[Drawing 12]



[Translation done.]

7

【0036】給紙部は、専用のモータ（図示せず）を有しており、半月ローラ16が矢字方向に回転して押上げ板152上に積載した転写材をさばき爪151の作用によりその最上層の1枚のみを搬出する。

【0037】給紙カセット15より搬出された転写材は搬送系統に入ってリターンし、先端が給紙ローラ17を通過したとき後に図示しない給紙センサの検知によってモータを一旦停止し、転写のタイミングが整った段階で再びモータが回転を始め、像担持体10の感光面に対し所定の角度を保ってその転写域に給紙される。

【0038】一方手差しによる給紙は装置本体の前面に位置する手差し給紙台Mを図1の一点鎖線で示す位置より奥側に示す位置に回転してセットして行う。

【0039】手差しされた紙はピンクアップローラ153の回転により搬送され、前述した給紙カセット156からの給紙と同様のプロセスを経て転写域に給紙される。

【0040】手差し給紙の対象とする紙は通常用いられる161b sないし241b sの一般の転写材Pの他、

361b sの厚紙やOHP用のトランスベアレンス等である。また手差し給紙台Mを取り外し、オブションとして専用のフィードを装着することで封筒の給紙も可能である。

【0041】転写ローラ18は像担持体10の周囲に對する位置が可変であって、単色画像のプリント時には常に圧接状態に置かれるが、カラー画像の形成中には選定して離開した位置に保たれた転写時にのみ圧接される。一方、分離ブラシ19も転写ローラ18の位置変動にほぼ同期して像担持体10の周囲に圧接ならびに離開の動作をする。斯かる転写ローラ18に印加電圧が+3とし、4KVDで、ブレードによってローラ面をクリーニングする形式の転写ローラ18が使用され、また分離ブラシ19にはDCとACを重ねたハイバース電圧を印加して使用される。

【0042】定着装置20は、一對のローラから成るいわゆる熱ローラ方式の定着装置であって、ヒータHを内蔵し時計方向に回転する上ローラ201と被上ローラ202に圧接して被動回転する下ローラ202との間に形成されたニップ部により転写材Pを加熱搬送してトナー像の定着を行う。上下の各ローラは共に耐熱樹脂を被覆されていて、圧接によりニップ部が連続的に形成されることにより、封筒等が搬送される際に生じ易い紙面のシワが防止される。上ローラ201の周囲温度は温度センサSに検知されることにより制御されて所定の温度範囲内に保たれ、またトナーの溶着によって付着した汚れはクリーニングローラ203の圧接によって除去清掃される。このクリーニングローラ203はプリンタ枚4枚程度で乾燥のものと交換される。また、定着ヒータは使用しない時間が所定時間を越えるとSLEEPモードとなり、省エネ制御される。

【0043】さらにOHPに使用されるトランスベアレンスに定着装置20は、一對のローラから成るいわゆる熱ローラ方式の定着装置であって、ヒータHを内蔵し時計方向に回転する上ローラ201と被上ローラ202に圧接して被動回転する下ローラ202との間に形成されたニップ部により転写材Pを加熱搬送してトナー像の定着を行う。上下の各ローラは共に耐熱樹脂を被覆されていて、圧接によりニップ部が連続的に形成されることにより、封筒等が搬送される際に生じ易い紙面のシワが防止される。上ローラ201の周囲温度は温度センサSに検知されることにより制御されて所定の温度範囲内に保たれ、またトナーの溶着によって付着した汚れはクリーニングローラ203の圧接によって除去清掃される。このクリーニングローラ203はプリンタ枚4枚程度で乾燥のものと交換される。また、定着ヒータは使用しない時間が所定時間を越えるとSLEEPモードとなり、省エネ制御される。

【0044】従って本実施例の装置は転写材の搬送速度を1.00mm/sec、5.00mm/secおよび12.5mm/secの3段階に切換可能とすることにより、普通紙、封筒およびトランスベアレンスの3種の転写材を使用出来るモードを備えて幅広い用途に対応して利用される。

【0045】なお、上ローラ201の設定温度は、低温度で溶融するトナーを用いることにより約180℃前後と低温化する事が可能であり、またオイルバッド204にスポンジ材（多孔質PIPE被覆）を用いることにより押圧ムラが解消されて均一なオイル塗布が実現される。

【0046】以上が本実施例における画像形成装置の概略構成である。

【0047】次に画像形成装置の制御回路について説明する。

【0048】図2は本実施例の画像形成装置における制御回路を示すブロック図であり、図3は画像搬送センサCの配設状態を示す斜視図である。

【0049】制御回路200は、図2に示すようにマイクログループセツタ210（以下に、MPUと略称する）とA/Dコンバータ250と、帯電制御用のプログラムを書き込んだRAM220、PWM制御を実行するプログラムモジュールを書き込んだRAM230とその他の電子制御を実行するためのプログラムモジュールを書き込んだRAM240と現像性固定手段を構成するプログラムを書き込んだRAM（図示せず）と、プリンタ特性検知手段及び最上面像速度換算手段を構成するプログラムを書き込んだRAMを備えるものである。MPU210は検知スクリーンを駆動するためのソレノイドにドライバ（図示せず）を介して接続してある。

【0050】プリンタ特性検知手段は、画像搬送センサCとMPU210及びテストパルス信号S₀を書き込んだRAM230から構成したものであり、実際のプリンタ特性及びそれら最上面像速度を検出するものである。当該プログラムは最上面像速度換算手段に相当するプログラムも含んでいて、

【0051】画像搬送後手段に相当するプログラムは、異度信号をA/D変換することにより256段階に正規化した出力電圧に対する画像搬送センサCの定格最大出力（像担持体上に何も付着しない状態で出力）との比を対数変換した値に像担持体10の温度と転写紙の温度との相違を考慮して画像搬送速度を得るものである。像担持体10の回転中に生ずる振動に起因する検出誤差を除去するために例えば像担持体10上に傾倒化した模様のパッチ像から得られる異度信号に所定の処理を

施して平均した値を算出する（特開平1-41375号公報参照）。これにより、MPU210は像担持体10の振動に起因する検出誤差を除去したプリンタ特性及び最上面像速度を検知できることになる。

【0052】MPU210は、選着率の変化により現像性に関係なく、トナー濃度を一定に制御するトナー濃度制御系であって、像担持体の現像量を光学的に検出する手段のように感光速度の変化に影響されない為に現像スリブ141の回転数を可変することにより反転現像方法における現像性を一定に担保する。

【0053】トナー濃度制御手段は、現像器14A～14D内に装填した現像剤の選着率をトナー濃度センサSで検出し、これによりトナー補給ユニット（図示せず）を駆動することによりトナー濃度を略一定に制御するものである。

【0054】現像性固定手段を構成するプログラムは、像担持体10上に傾倒化したパッチトナー像1に於いて、現像スリブ141の回転数を制御することにより、感光速度の感光特性を越えた現像性を得るようにするものであり、現像性と密接に関連するトナー濃度を一定に制御することにより、現像スリブ141の回転数を制御して像担持体10表面の現像領域において付着する現像剤の量を变化させて最大画像速度を調整する。現像性固定手段を構成するプログラムは、二成分現像剤を採用する場合、現像剤内のトナー濃度を一定に制御する機構及び制御プログラムを含むものである。A/Dコンバータ250は増幅器251を介して画像搬送センサCを接続してある。増幅器251は画像搬送センサCからの出力レベルをマイクログループセツタ210の駆動電圧レベルに増幅するものである。

【0055】画像搬送センサCは、図3に示すように赤外光を発する発光ダイオードLED（発光ダイオードLN66、鹿児島下電子株式会社）とボトランジスタPT（ボトランジスタPN101、鹿児島下電子株式会社）との受光面の中心が40°、40°の角度をなすような構造をケージングCKに形成し、当該間に発光ダイオードLED及びボトランジスタPTに嵌入したものである。ケージングCKの全面は、像担持体10の表面に水平になるようにクリーニングユニット22の近傍に像担持体10の中心に對向するように像担持体10表面から6mmの間隔で設けられている。画像搬送センサCは、発光ダイオードLEDとボトランジスタPTとでボトランジスタPTを構成してあり、発光ダイオードLEDのノード端子には最大出力10（V）の可変電流電源V_{ref}（図示せず）を接続してあり、発光ダイオードLEDのノード端子には例えば1k（Ω）と2k（Ω）とに切り換え可能な半導体抵抗素子VR1（図示せず）と固定抵抗素子R8（図示せず）を接続してある。このような構成にすることにより、可変電流電源V_{ref}の出力電圧を可変して発光ダイオードLEDの発光強度を調整するようにしてある。ボ

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【0056】図4において、矢印は像担持体10の回転方向を示してあり、斜線はトナーが付着していることを示している。図4（a）は5つのパッチ像を示したものであり、パッチ像を形成する線の幅は50μmであり、パッチ像を形成する線の幅は50μmで一定にして線の間隔50μm、75μm、100μm、125μm、150μmの間を变化させた状態を示してあり、図4（b）も5つのパッチ像を示したものであり、パッチ像を形成する線の幅は100%、80%、60%、40%、20%と順次細くなるように変化させた状態を示している。いずれのパッチ像においても当該パッチ像を形成するトナー像は特定の単色でも、2つの色を重ね合わせた二色でも、基本的な動作は同じである。パッチ像を形成するトナー像の中で、幅の最も細いもの（パッチ像を形成するトナー像の中で、幅の最も細いもの）は、予想されるすべての変動を考慮しても隣り合ったトナー像と重なり合わない太さに設定するのが好ましい。幅の最も太いものは、予定される全ての変動を考慮しても、常に隣り合ったトナー像と重なり合うに過ぎないに設定することが好ましい。又、パッチ像の大きさは感度を確保するため、センサの測定範囲より大きくしておくことが望ましい。

【0062】図6及び図7はいずれも反射強度と斜周角との関係を示すグラフである。

【0063】図6及び図7に示すグラフは図4（a）に示したパッチ像から得られる反射強度とパルス幅との関係を示したものである。図7に示すグラフは汚れによって感度が低く測定された場合を示すものである。い

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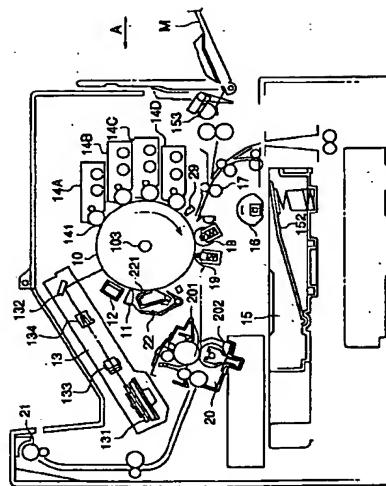
16

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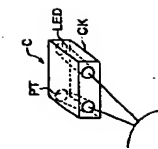
【符号の説明】

- 【図10】トナー像の縁幅を直接的に測定する縁幅測定手段を示すブロック図である。
- 【図11】トナー像の縁幅を間接的に測定する縁幅測定手段を示すブロック図である。
- 【図12】縁状のトナー像の幅が変動する現象を説明する模式図である。

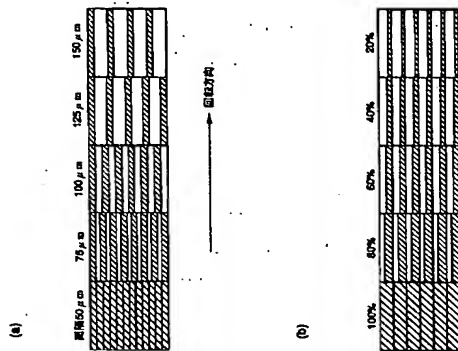
【図11】



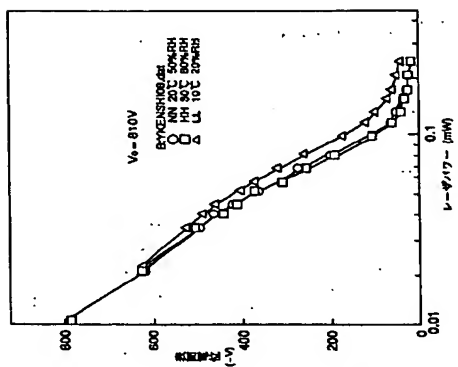
【図3】



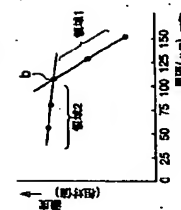
【図4】



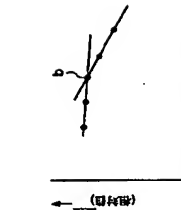
【図5】



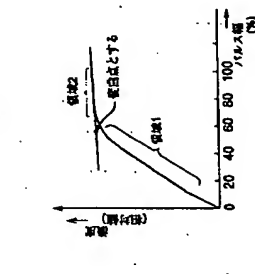
【図6】



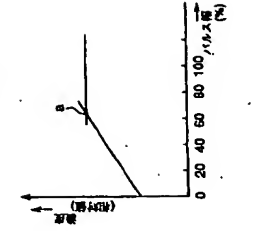
【図7】



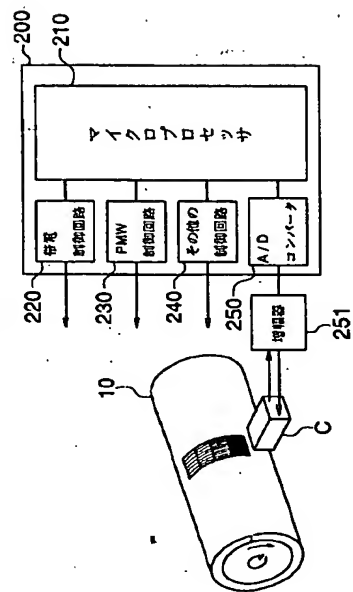
【図8】



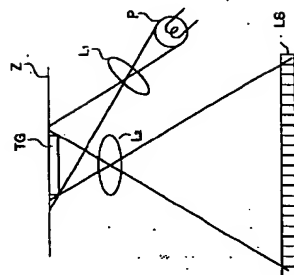
【図9】



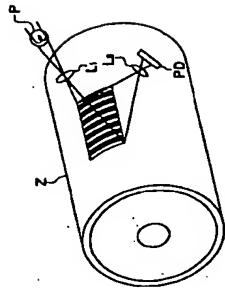
【図2】



【図10】



【図11】



【図12】

